

THE WORLD SCANNER REPORT

A Journal of VHF-UHF Scanner Technology & Engineering

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THIS IS A COMBINED ISSUE

Remember, we publish ten times a year so this issue marks the half-way point for 1991, and is more or less combined with June as a single issue. You won't get a June issue, specifically. The same thing will happen at the end of the year when November and December are combined.

THIS MAY BE YOUR LAST ISSUE UNLESS YOU RENEW SOON!

Check the "Expire Date" in the upper right corner of your mail label. If it says "May 91", then your subscription will expire with this issue. You can renew any time to take up where this issue leaves off. If your budget is tight for this month, drop a line saying so, and we'll go ahead and send the July issue on time and trust that you will renew before the August issue comes out. If you don't plan to renew, drop a note to briefly say why not and we'll send you the July issue anyway just to express our appreciation of your patronage. Fair enough?

IF YOU WANT TO RENEW

Then do so right away so we can lay plans for the next year. You can take advantage of decent discounts and renewing for one full year, or even two for the maximum. Rates are unchanged at \$15/6-mos; \$25/yr or \$45/2-yr. We are growing and we're getting better. Please come along!

NOTE THE NEW TYPE STYLE IN THIS ISSUE

Actually, it's not new; we've had it all along. It's just that this particular printer is about as slow as molasses flowing through a straw in the winter. That's not the only reason it has not been used before; this print is about 12% larger, which means a 12% reduction in the amount of information. In the past, I felt you might prefer more info at the expense of a less neat typestyle. There have been several justifiable complaints, however, so I'll try this style of print on you and see how you like it. Your feedback will be appreciated and it might even influence the decision on whether or not we stick with it. Is it a good tradeoff? Please tell me!

ERRORS IN VOL-2 OF THE SCANNER MODIFICATION HANDBOOK

Three technical errors have emerged in Vol-2 of the SMH so far. Please make corrections in your copy of the book as follows: Page 58; Step 7.8: Change "IC-5, Pin 10" to "IC-4, Pin 12". Then turn to page 83; MOD-5, Step C: Change "Pin 3 of IC-6" to "Pin 6 of IC-6". Then, in the next sentence, change "PRO-2004" to "PRO-2005". That's all the glitches so far other than ignorant typos. Sorry for any inconveniences this stupidity may have caused.

ADDING CW & SSB TO YOUR SCANNER ?

This has been a back burner project of mine for over a year now, and I just haven't gotten around to working out the details. Recently, a reader sent me info about an article in the May-1990, issue of POPULAR ELECTRONICS MAGAZINE, titled "Add CW & SSB To Any Shortwave Receiver" by Michael Covington. The circuit is super simple and I hoped it might do the trick. Maybe not, because I tried it six different ways and it failed to work. Maybe I am overlooking something. Have any of you tried it? The principle seems sound but I'm missing out on something. I'll be glad to send the info to anyone who would be interested in brewing up this little circuit and report the results back to me. If you want the info, send me a SASE and one loose extra stamp. The principle of this circuit makes it a credible candidate for SSB detection in the PRO-2004/5/6 scanners and other scanners which have the AM mode and 25-30 MHz coverage.

Just understand that SSB on 30 MHz and up is practically non-existent though apparently the new Land Mobile band, 222-225 MHz has been authorized for Amplitude Companded Sideband (ACSB). United Parcel Service was planning to set up a nationwide dispatch/shipment tracking system on this band using ACSB but I hear that it has been either delayed or shelved for the time being. Maybe in time, we'll see some SSB activity on VHF & UHF. For now, the only SSB of significance is between 27-30 MHz; CB'ers, Freebanders and Hams operate SSB in that range. There may also be a few survivalist groups operating with SSB between 25.5 MHz and 26.5 MHz.

A FANTASTIC SOURCE OF ELECTRONIC PARTS & SUPPLIES

Most of my modifications and electronic projects are designed around the Radio Shack catalog because it is such a universal reference book and it's best that we all play to the same "sheet of music", so to speak. Alas, Radio Shack steps to the beat of its own drummer and does not carry many things needed by the electronic hobbyist. We have to turn to outside sources for the more critical chips, parts and supplies for our modifications. By and large, you're referred to "your local electronics supply house" in my books and here in the "WSR". Come to find out that many readers just don't know where else to turn if Radio Shack can't meet their needs. Relax now!

DIGI-KEY CORP, a large mail-order electronic supply firm puts Radio Shack to shame in the parts department and the prices are hard to beat! Digi-Key claims to ship 99% of all orders within 24-hours, also hard to beat. Get on their mailing list for a great catalog which is issued every 2-months. Write or call as follows:

Digi-Key Corporation; PO Box 677; Thief River Falls, MINN 56701-0677, or call (800) 344-4539. Digi-Key has an extensive inventory of small electronic parts, including chips of all brands & kinds, transistors, resistors, capacitors, coils, chokes, resonators, crystals, LEDs and relays. Digi-Key also has a good stock of electronic tools and test equipment. And they deal in nickels and dimes as well as in bucks! Definitely hobbyist oriented!

----- FROM FIDONET'S COMPUTER BULLETIN BOARDS -----

Public Message (Sent)
Message # 9136 *SHORT-WAVE*
To : Paul Scalzo
From : John McColman
Subject : Re: AR-3000 RECEIVER
Date : 91/04/08 1:3:00

I've been satisfied with the sensitivity of the AR-3000, not overwhelmed, but definitely satisfied. The extra little features like for search (being able to lockout individual frequencies) makes the radio unique. It is not as fast as I'd hoped, but I like it overall.

--- TBBS v2.1/NM

* Origin: ANARC BBS-Assoc.of North American Radio Clubs (913)345-1978 (280/3)

Message #8443 - SHORTWAVE
From : Dan Morisseau on (1:202/701)
To : Chris Conner on (1:202/719)
Subject : AOR AR-2500
Date : 14-Apr-91 22:23

CC> I am interested in purchasing a continuous coverage CC> scanner and I am considering the AR-2500. Can anyone CC> who has had some experience with this particular CC> model please let me know how you liked/disliked it.

Chris - I owned a 2500 for about 25 days and felt obliged to return it to ACE for the promised refund. It was extremely plagued by images from commercial FM broadcast throughout the VHF-Hi band and was just plain impossible to use on VHF-Lo because of birdies. I tried a number of "fixes" suggested by ACE, including an FM trap from Radio Shack and a higher output power supply. Nothing worked to any degree of satisfaction. It WOULD work on UHF freqs IF the attenuator was switched in. Performance on freqs below 30 MHz was not fully explored, but from what little I did play around, it seemed to be worse than VHF. In short, Chris, I would not recommend this unit to anyone, based on my experience. I have since taken the money I put in the AR2500 (and more) and invested in an ICOM R-7000. I am more than satisfied that I got my moneys worth there. Suggest that you save yourself a great deal of inconvenience and disappointment and search for another radio. As I said above, the ICOM R-7000 is a lot more expensive, but it is a lot more radio, too.

* Origin: The Boardwalk! * Master Series Support * 206-941-3124 (1:343/47) [EDITOR'S NOTE: This message was edited for brevity.]

CELLULAR & OTHER MODS FOR THE REGENCY TS-2 TURBO-SCANNER

I haven't actually done the cellular restoration mod, but thanks to Larry Rosen who sent me a copy of the Service Manual for the TS-2, I was able to determine a probable best course of action. Remove the top cover and examine the top-right-front area of the receiver behind the front panel and locate the "Processor PCB Assy". There will be a large 40-pin IC chip, U-502, to capture your immediate and exclusive interest. Find Pin 40 and nearby resistor, R-512. Examine the board, front or back, between R-512 and Pin 40 and note where Pin 40 is jumpered or wired to ground. Remove or clip that ground to restore cellular capability. BEWARE that intercepting cellular phone calls is a violation of the ECPA. A review of the TS-2 Manual suggests several other possibilities for mods:

- (1) A standard 16-pin NFM chip is used, so refer to V1N4, page 6 and associated articles for hints in this area.
- (2) A speedup might be achieved by replacing Y-501, a 4.19 MHz crystal with something 50-100% higher in freq.
- (3) SW Interface (MOD-14); Extend Delay (MOD-29); Event Counter (MOD-30); CTCSS (MOD-31); Carrier-On Indicator (MOD-32); and the Auto Tape Recorder Switch (MOD-33) all should be possible to do on this rig.
- (4) TAPE RECORDER output is probable by tapping the high side of the Volume Control via a 0.1-uF capacitor. Use shielded mic cable to the new jack if you install one.
- (5) S-metering is probably not feasible in this unit.
- (6) Extra memory channels and recovery of other freqs also not probable

----- THE SCANNER MODIFICATION HANDBOOK CORNER -----

MOD-30 Event Counter Note

A slick little mod that's easy to do and can be most useful not only with your scanner but perhaps in other areas limited only by your imagination. The Counter Module requires a "AA" flashlight battery for operation. If you're like me, your first instinct was something like, "Aw, geez, not another battery to run down every few days". Change "days" to years. I've had a cheap AA battery in my Event Counter for over six months now, and the terminal voltage still measures over 1.5-v. Moral: don't bother with trying to feed external power to the module as I first considered. Just replace the battery every 6-12 months whether needed or not!

PRJ-3 Snatch 'N Latch DTMF Decoder Note

Vol-2 of my book discusses a super slick telephone dial tone decoder that can be used to decode dial tones that you hear over your scanner or dial tones from just about any source, including direct from the phone lines and from recordings made on tape. HB Technologies, the developer, now has available an etched circuit board ready to stuff with a handful of components to complete the Snatch 'N Latch project. They even supply the more difficult to obtain DTMF decoder chip, and perhaps other

parts. The availability of the printed circuit board makes this project a snap. Write to HB Technologies, PO Box 2771, Spring Valley, CA 91979 for more info.

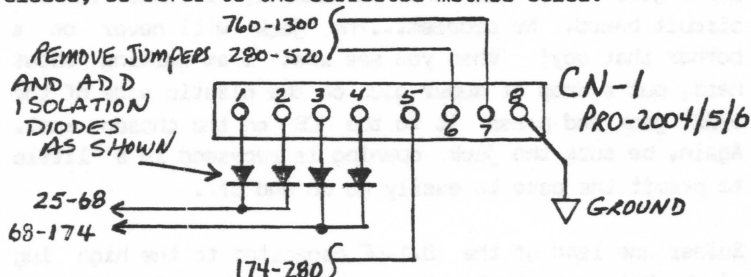
The Snatch 'N Latch DTMF Decoder board can be installed in a small project box or even inside of most scanners. I've built two so far, one that will fit into a pocket for portability and the other is attached to my PRO-2004 TurboWhopper scanner via a remote box and umbilical cable. A neat and sometime useful snoop gadget!

The New Wish List; Item 4

Electronic RF Attenuators may now be available that can be adapted to our scanners! Chris Storey of Los Angeles, CA, called my attention to a "TTL Controlled Attenuator" made by Mini-Circuits, Inc, PO Box 350166; Brooklyn, NY 11235-0003; (718) 332-4661. The 50-ohm TOAT-series performs with 6-usec switching speed and handles power levels up to 1-milliwatt. Several styles and packages are available, some that look like IC chips and others in a metal enclosure with connectors. Contact Mini-Circuits for more info. Suitability for scanners is not known at this time, but you can ask them!

The New Wish List; Item 9

I haven't done the hypothetical "High Speed Electronic Antenna Switcher" discussed on pages 216-217 in Vol-2, but the idea still gnaws at me. Every now and again I look at the diagram on page 217, and an "error" jumped up at me that I'll tell you about here. Refer to the right side of the drawing at the 8-pin connector. Notice where I have shown jumpers from Pins 1 & 2 and 3 & 4? Well, this would cause immediate problems if you tried to use two bands to control one antenna as shown. Instead of the jumpers as shown in Fig 5-1, we'll use some isolation diodes, so refer to the corrected method below:



Another change for the better that occurred to me to mention is to change the 1-k resistors to 2.2k, 2.7k, or even 3.3k to avoid loading down the front end circuit. The 470k resistor might be reduced to 220k, but it must remain a rather high value, certainly above 100k. Has anyone experimented with this circuit yet?

BOOK REVIEW: THE UNIDEN COOKBOOK

One's for you hams, CB'ers and Freebanders who use any of several transceivers of Uniden origin including the HR2510, HR2600, Realistic HTX-100 and the Lincoln

export rigs. The UNIDEN COOKBOOK is a compilation of some 20 mods, tips, tricks and kinks on the above radios. Among this hot stuff are power increases, variable power controls, improvements in the noise blanker and audio circuits, and troubleshooting charts. Easy to read and comprehend, THE UNIDEN COOKBOOK is available from its author as follows: -----> Bud Stacey KC4HGH; PO Box 907; Satsuma, AL 36572 <----- I don't remember the price, so send Bud a SASE and an extra loose stamp for the details.

==-- A READER'S REVIEW OF THE ICOM 24/AT TRANSCEIVER ==--

I am a licensed ham, so the appeal of the ICOM 24/AT Handheld was too much to pass up. I spend lots more time scanning than hamming, so the idea of a scanner that also transmits (for highway emergencies or just socializing) was a bit too much to pass up. Of course, ICOM sells the 24/AT as a ham radio that just happens to scan. The out-of-band receive/scan features are not emphasized. The 24/AT scans 40 channels between 75 MHz and about 1 GHz. Operation of the unit side by side with a Bearcat 200 XLT on the VHF-Hi & UHF bands indicates that the sensitivity of the 24/AT is notably superior. In the 860 MHz range, I'd give the ICOM a slight edge. I won't elaborate on the ham related features since that's a bit beyond the scope of the "WSR" except to say it is an outstanding unit with exceptional performance. I will offer some comments to potential buyers of the 24/AT as a scanner:

The scan speed is slow compared to the conventional Uniden/Realistic scanner. The priority channel cannot be used while you are scanning. When you turn the unit ON, it does not automatically resume scanning, you must manually initiate the scan function. There are bells and whistles, like signal strength display, auto turn on/off timers. Generally, all can be selected or deselected.

The large number of keyboard selectable features often requires that more than one button on the small keyboard be pressed at once, so it is difficult to invoke these options while driving or walking. All in all, I give the 24/AT very high marks, though it takes a little while to adjust to its complexity and peculiarities.

By: D. L. Goodson; Orlando, FL

[EDITOR'S COMMENT: One wonders if the 24/AT can be made to transmit out-of-band; some do, I understand...../bc]

==-- A TIP ON EXTERNAL SPEAKERS ==--

If you're deaf in one ear and can't hear out of the other like me, then you probably find lots of fault with the speaker that's in your scanner. It's cheap, funky and ineffectual unless you're sitting right on top of it. I found a great all-purpose extension speaker some years ago that's still available today. Radio Shack's CB Extension Speaker, # 21-549 is a real performer for the tone deaf like me. What makes it so good, not to mention the compact case, nice mounting bracket and long cord, is the actual speaker element inside the case! It's got a

huge magnet on a sturdy frame quite similar to #40-1197 replacement speaker. The bottom line is that it works very well for the intended purpose.

Hobbyists sometimes go to unneeded extremes to fashion external speakers for the listening post. I've seen costly stereo speakers in use that didn't sound any better than the scanner's stock speaker. No wonder. The audio reproduction circuits in shortwave and scanner receivers are designed for the VOICE band of 300 Hz to 3000 Hz and that's all that the speaker will ever get. It makes no sense, then, to go overboard. In fact, best is sometimes worse in this case. Fidelity is one thing and intelligibility can be quite another. Your home stereo requires fidelity but your listening post demands intelligibility! Communications receivers can produce distortion above and below the voice band which can be reproduced in a hi-fi speaker to muddle or diminish the needed intelligibility. It's best to select a speaker precisely tailored for radio comm, and that means center performance at about 1.5 KHz with upper and lower cutoffs of about 3 KHz & 300 Hz, respectively. Radio Shack's CB Extension speaker is eminently suited for this job. And, it's very, very rugged; ideal for mobile, portable and most any other commo application.

---- NEW CELLULAR PHONE BANDS ----

Right after Vol-1 of my Scanner Modification Handbook went to press, the FCC authorized additional channels for the CMT bands. This may or may not render obsolete the charts & tables in Vol-1, pages 64, 66, 68 & 69, because the new freqs are not in use in all areas yet. Cellular phone bands are listed below for your reference:

FROM	TO	CLASS	NATURE OF SERVICES
-----	-----	-----	-----
824.010	834.990	Cell Mobiles	Non-telephone Company
835.020	844.980	Cell Mobiles	Telephone Company
845.010	846.480	Cell Mobiles	Non-telephone Company
846.510	849.000	Cell Mobiles	Telephone Company
869.010	879.990	Cell Bases	Non-telephone Company
880.020	889.980	Cell Bases	Telephone Company
890.010	891.480	Cell Bases	Non-telephone Company
891.510	894.000	Cell Bases	Telephone Company

As you may know, cellular mobiles are not usually worth monitoring because of very short range and one-sided conversations. Incidentally, the mobile frequencies are always exactly 45.000 MHz below the base frequencies. So if you hear a cell site on 891.540, the mobile will be on 846.540. NOTE: it is illegal to monitor cell mobiles and bases, but you knew that anyway. I just mention it again to keep from getting jailed for making you think it's ok.

---- MODS, TRICKS & STUFF FOR THE PRO-34 ----

Handheld scanners are pretty neat, but they're used about

90% of the time in fixed locations, usually the listening post. It would be neater if they came with some of the frills, bells and whistles common to base scanners. But then handheld scanners sometimes need bells and whistles in portable operations, too. Ok, we will just have to do the job for ourselves. ATTENTION PRIVATE DETECTIVES & LAW ENFORCEMENT PERSONNEL: The first two mods below may be eminently applicable to your needs!

Tape Recorder Output Jack

This one is easy. The "high" lug of the Volume Control carries just the right level of audio signal for most any tape recorder and it's accessible. But where to put a jack? Remember, we have to keep the scanner maintainable and easy to disassemble, so we don't want any jacks installed in the plastic case to complicate future access and maintenance. No sweat! First snag a pair of submini 3/32" phone jacks, RS #274-247 and a 0.1-uF capacitor, RS #272-135 or 272-1069. That will be all you'll need here. Save the spare 3/32" jack because you'll need it below for the Automatic Tape Recorder Switch.

Remove the back plastic case of the PRO-34 and lay it aside. Position the scanner so that you're looking at the rear, exposed circuit board with controls up and battery compartment down. Now eyeball the area of the upper left corner where the Volume Control is and then downward an inch or so to T-102. That area between T-102 and the Volume Control along the edge of the PCB is quite flat and unencumbered with parts. A perfect place to super-glue one of the 3/32" phone jacks on its side with the plug opening pointing outward to the left side. Move the jack around a little first to make sure the scanner's case can be reinstalled without touching the jack. In other words, the jack will be recessed from the side panel just a little and permanently affixed to the circuit board. No problem...the jack will never be a bother that way! When you see what I am talking about here, put a drop of super glue on the plastic side of the 3/32" jack and press it to the PCB on the chosen spot. Again, be sure the jack opening is recessed in a little to permit the case to easily go on and off.

Solder one lead of the 0.1-uF capacitor to the high lug of the Volume control. One end lug of the Vol control is ground and has a BLACK wire, so the other end lug with the GREEN wire is the one where to solder the capacitor. Solder the other lead of the capacitor to the rear lug of the 3/32" jack that's farthest from the ground lug. Solder the ground lug of the 3/32" jack to a nearby PCB ground trace. You may have to scrape some green lacquer off the ground trace first. When done, there will be an unconnected lug on the 3/32" jack, and that lug will be between the ground lug and the hot lug.

Temporarily reinstall the rear case....and mark where a hole will have to be in order to access the jack from outside. This is a trial & error operation mostly, and

when you think you've got the spot, drill or melt a tiny hole through the side of the case to align with the jack opening. Then close the case to make sure your hole is on center with the jack. If not, make enlargements of that hole in the necessary direction to get it centered with the jack. Once you're sure it's centered, then drill it out to 3/8" diameter, to accommodate the plug that will be needed! That's it; you're almost done now. Make up a patch cord with shielded coax or mic cable to fit between this jack and your tape recorder. You can now record any signal that's picked up by the PRO-34. Furthermore, the mod is self-contained and will never hinder future access to the innards of the scanner!

Automatic Tape Recorder Switch For the PRO-34

Tape recorder jacks on scanners are mostly worthless unless you're right there, Johnny on the spot, to operate the damn things all the time. A tape recorder output and my Automatic Tape Recorder Switch (ATRS) go together like kids and puppies, however. See Vol-1, MOD-6 and Vol-2, MOD-33 for two varieties of ATRS. We will use MOD-33 in the PRO-34 by virtue of its simplicity and smaller size. Instead of building MOD-33 on a perf board as shown in Vol-2, we'll have to build it component by component right into the PRO-34. Space in there is very limited, you see and we need to keep things condensed. But it's not difficult as you will see.

The hardest part is the 3/32" jack required for the Remote Control function output but it's no more difficult than the jack we installed just above for the Tape Rec Output. Remove the rear case of the PRO-34 again and scope out the left side of the exposed PCB. Find T-102 again and then just down the board from it is a thing that looks like a quartz crystal, XF-101. Well, right there between T-102 and XF-101 is a prime spot for the 3/32" Remote jack...almost. Try a fit and you'll see that it's tight. File the sides and lower corner edges of the 3/32" jack until the fit is perfect. It won't take much. Taking the same precautions described above for the Tape Recorder Output jack, super-glue the Remote jack to the PCB so that the jack opening points outward to the side of the case but does not get in the way of opening and closing the case. Now put the rear case back on and mark a spot that centers over the opening of the 3/32" Remote jack. When you're sure it's centered, drill out a 3/8" hole to accommodate a Remote patch cable.

Use the diagram on page 188 in Vol-2 of my book, but three of the parts will change. Instead of the relay called for there, use RS #275-232, a 5-v reed relay; it's small with low current needs! R-1 and R-2 should be changed to a single 100-k resistor, RS #271-1347. Install the LED (D-2) to be visible as a "Carrier On Indicator" if you want; it is necessary for the circuit but it doesn't be visible unless you want. I installed my LED in a hole between the Volume and Squelch Controls! Now decide where to install the On-Off switch for the ATRS.

I installed mine between the Antenna Connector and the Squelch Control. The RS micromini toggle switch #275-624 is suitable but don't use anything larger.

Super-glue Q-1, the 2N2222A switching transistor, upside down to the top of IC-101 on the PRO-34's PCB. Solder one end of the 100-k resistor (new R-1) to Pin 13 of IC-101 and the other end to the base of Q-1. Solder the emitter of Q-1 to a nearby PCB ground spot. Physically lay the reed relay (pins up) in the uncongested area between C-205, TP-105 and C-216. It will kind of wedge in there without harm. Assuming that the LED and on/off switch are mechanically installed, complete the wiring of the relay, D-2 LED, S-1, J-1 and D-1 in accordance with the diagram on page 188 in Vol-2, and that will do it! Be critical of your hookup wire; use wires salvaged from RS #278-776 or 278-775 and DON'T use their regular hookup wire if you know what's good for you and your PRO-34.

NOTE: Don't ground any of the lugs on the 3/32" Remote jack to scanner ground. They should be connected only to the relay pins and nothing else. The ground lug of the Remote should be wired to one of the relay switch pins and the lug on the jack farthest from the ground lug will be wired to the other relay switch pin. The middle lug of the Remote Jack will not be connected.

Speeding Up Scan and Search in the PRO-34

This is well covered in MOD-38 in Vol-2 of my book, but I can add a little to it now. The best way to do this mod is to remove CX-1, the original stock 2 MHz resonator. This is done by lifting the Logic/CPU Board up and out of the front case so you can access the bottom side of the PCB. Drats, but there's a shield in right over the solder points of CX-1 and it will have to be desoldered in three places to be moved out of the way. A hassle, but worth the time and effort. Desolder CX-1 and remove it from the board. For warp drive, install a 7.37 MHz resonator salvaged from a speeded up PRO-2004 or 2005, or else order the 7.37 MHz resonator from Tandy National Parts in Ft. Worth, TX; (800) 442-2425. Ask for part # CST7.37MT from either the PRO-2004 or 2005. My PRO-34 now races along at something like 33-ch/sec; of course the delay was reduced to about a half-second, but...!!! You can always go with something a bit more "reasonable" like 3 or 4 MHz. Radio Shack's color burst crystal at 3.58 MHz, #272-1310, has been reported to work well.

--- DANGER WITH RADICAL SPEED-UPS IN SCANNERS ---

There's a lot of hype and hyperbole about speeding up the scan & search rates of scanners these days. There is also a danger of blowing up the expensive CPU chip if you get too carried away. Let me explain: CPU's are little more than a container for a huge array of electronic "gates" or doorways. All CPU's are driven by a clock oscillator for precise timing or synchronization of those gate openings and closures. The critical thing here is

that every opening or closure requires a bit of current. When the clock oscillator is increased in frequency, then there are more gate operations per second, and therefore a higher current requirement per second. Well, current flow per second is a basic quantity of power...and one form of power is heat! And, heat destroys CPUs. So the faster you run them, the greater the current drain and there is a point where a failure will occur. Count on \$40, minimum, if you replace the CPU yourself; and \$100 & up if someone else has to do it. I can't be sure of all the exact engineering limits of the CPUs in various scanners, but I am fairly certain that up to 10 MHz is safe in the PRO-2004 and 2005; 16 MHz for the PRO-2006; 7.37 MHz for the PRO-34; 800 KHz for the Uniden BC-200/205XLT, and that's about all on which I can speak with any certainty. As a rule, 50% speed ups appear fairly safe; any more than that without knowing for sure could lead to problems. I am quite confident that 18 MHz blew up a CPU in one PRO-2006 that I know of, though I have successfully used 18 MHz in a number of others. As a result of this suspicion, however, I will not take a 2006 above 16 MHz anymore. Speeding up scanners is a lot like revving car engines. Use caution; there are limits!

=== SPEEDING UP THE BC-200/205XLT & REGENCY R-4030 ===

MOD-41 in Vol-2 of my Scanner Modification Handbook covers this pretty well, but at the time I didn't know of a ready source for speed up resonators unless you were willing to buy a zillion from Murata-Erie which won't sell you just one. Now I know where you can get just one and maybe a few other neat things besides. See page 2 of this issue for the address & phone number of Digi-Key Corp. They have Panasonic EFO-A800K04B ceramic 800 KHz resonators for sale at less than a buck each. Digi-Key's part number is P-9947. An 800 KHz resonator will double the SCAN & SEARCH speeds of the BC-200/205XLT. Digi-Key also has slower resonators if you'd prefer milder speeds.

By the way, 16% of "WSR" readers own a BC-200/205XLT. How do I know? From the data on the subscription blank!

=== HOT TIP FOR PRO-2004/5/6 & OTHER BASE SCANNERS ===

After your base scanner has been operating for a while, put your hand on the top cover. Notice how warm it is? If as cool as a cucumber, then go on and find something else to read in this issue. If the case is any warmer than the surrounding air temperature, then this article is for you (and your scanner).

A handheld scanner is great; stick in a battery pack and off you go; else power it from an AC-DC adaptor. Base scanners are great too; plug 'em into the wall where they stay and heat up. Heat accelerates the aging or metabolic rate of just about everything in the Universe, especially things electronic or electrical. Cooling or prevention of heat build-up will prolong the life of most electronic equipment, and your scanner is a composite example of the

point I will be making here. Inside your scanner is a bit of practically everything, from crystal to oscillator to computer to RF and audio amplifier. All these circuits work best and last longer if operated at reasonably cool temperatures. Refrigeration not necessary; just reas

Whenever electricity flows in a circuit, a bit of heat is generated from every device through which current flows. By and large, we can't do anything about that. Power (P) equals Current squared (I^2) times resistance (R). So if two milliamps flow through a 1000 ohm resistor, then $.002^2 \times 1000 = .004$ watts generated. Not much, but more or less current flows through lots of circuits with lots of components in your scanner, and each one releases a bit of heat into the air inside the case. Cumulatively this might add up to several watts which even in a closed space will not cause an inordinate rise in temperature. So why does the scanner's case FEEL WARM, even hot? There is another source of heat that can be under your control! The transformer in the scanner's power supply.....

If your scanner is one like the BC-760/950XLT, then things are already under control since it does not have an internal power supply; it runs from an external AC-DC adaptor or other DC power source. But if you have a PRO-2004, 2005, 2006, or other base scanner with a cord that plugs into a 110-v wall socket, then you've already noticed how warm your scanner can get. And you can do something about that at relatively low cost.

If yours is A/C powered, then all current that circulates in your scanner has to pass through the power transformer first and that's where a lot of that current is consumed and transformed into HEAT! That heat is radiated into the air space inside the scanner where it raises the temperature of everything; not just the case that you can feel! The "secret of scanner immortality" is to not use its internal power supply!

The PRO-2004/5/6 and many other base scanners come with a DC power jack on the rear panel. This jack has a tiny switch in it which if the proper plug is inserted, will disconnect the internal A/C power supply and allow the scanner to operate from a source of external DC power! It is highly recommended that YOU power your scanner this way to minimize the heat accumulation inside the scanner, and make it run demonstrably cooler! So how to do it?

All you need is a power supply or an AC-DC adaptor that will provide 10 to 16 volts and rated at about 500-ma (1/2 amp). Radio Shack has four models that will power the PRO-2004/5/6 or any of their base scanners: 22-120; 22-127; 273-1653; 273-1652. The first three are a bit pricey because they're designed to handle more than just a scanner, but the last one is priced right and it comes with the exact plug that you'll need. Get the polar of the plug right with center (+) and outer shell (-) and you'll be in business. After a while, notice how cool your scanner runs and then feel the AC-DC adaptor...it

will be warm...and that heat will not be accumulating inside the scanner!!!

Some of you more technical types might suggest that a regulated power supply is best from which to operate the PRO-2004/5/6 or other base scanner. Really, it doesn't matter, though if you already have one available, then by all means, use it. The thing is that the built-in power supply in the PRO-2004/5/6 is cheap, rated at 12-v/500-ma which then feeds several regulator circuits. It's no different if you use an external supply, which will also feed the internal regulator circuits. So you can drive your PRO-2004/5/6 with most anything between 10-16 vDC so long as it can produce upwards of a half-amp (500-ma) or so. There is only one circuit in the PRO-2004/5/6 which operates on an unregulated voltage, and that is the audio power amplifier chip, IC-7, which runs straight off the 12-v supply line. IC-7 is capable of operation over a rather wide range of at least 8 to 16 volts, so it is not critical at all. USE AN EXTERNAL DC POWER SOURCE FOR YOUR SCANNER TO MAKE IT RUN COOLER AND PRESERVE ITS LIFE.

What If Your Base Scanner Doesn't Have A DC Jack?

Why not install one? Chances are that the mfgr left it out to save a buck. Most modern scanners can be readily converted to work with external 12-vDC if they don't already come that way. You'll need a drill, a bit of wire and a jack of choice. An RCA Phone jack will be just fine and is easy to install and connect. You can also use a standard coaxial power jack such as Radio Shack's # 1563 or similar. I'll leave that up to you. The main thing you need to know is about the wiring of the jack. Its shell or the part that contacts the scanner's metal chassis will be (-) while the center or hot lug will be (+). Now you know the hard part.

Chances are that the scanner has an internal 12-v power supply which is hard-wired to the 110 VAC cable. The low voltage DC output of the internal power supply will run

pretty much straight to the ON-OFF Switch, and that's where you'll want to pay attention with a voltmeter. Connect the (-) lead of the voltmeter to the scanner's metal chassis or a PCB ground trace. Use the (+) lead of the meter to measure as described below. One side of the On-Off switch will have full time +12v, give or take a couple of volts regardless of whether or not the switch is ON. (+10 to +16 vDC will be fine.) Now the other side of the switch is where you'll verify with the voltmeter that is turned ON or OFF with the switch. When you find that spot, solder a wire to the unswitched lug. Solder the other end of that wire to the center or hot lug of the new power jack discussed above. Bingo! You're done! Now your scanner can go mobile if you like or it can be operated on the base (much cooler) with an external AC-DC Adaptor as discussed in the preceding section of this article. A word of caution: don't leave the A/C cord plugged into the wall if you're using external DC power. Your new DC Power Plug probably won't be switched like that discussed for the PRO-2004, 2005 & 2006.

NOTE: It is possible, though not probable, that some base scanners will use an internal power supply radically different from 12-volts. If yours is such, sorry this article isn't for you. That's why you need to make a couple of basic checks with a voltmeter first. If the switched voltage that you encounter is between 10 and 16 volts, then you're in good shape; a 12-v external AC-DC Adaptor or automotive 12-volts will power your scanner.

--- MORE DIFFERENCES AMONG THE PRO-2004/5/6 ---

Ever since the PRO-2005 came out and then the 2006, I have been saying that they're all the same radio. Well, they are, but there are small differences from one to the next. Last issue, we showed you how to implement the PRO-2006's nifty Squelch Hysteresis switch into your PRO-2004, 2005 and maybe other scanners. We all know about the different CPU in each of the three, and how the 2006's runs much faster than the 2004/5. There are two

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other differences that I want to tell you about now.

First, did you know there are two different versions of the PRO-2004's CPU? Early models came with a CPU marked GR-327 while later ones are GR-0327A. The earlier 327 is programmed to switch the 30-KHz Step increment on for the old Cellular Phone bands of 825-845 MHz and 870-890 MHz. The later 0327A CPU kicks in the 30 KHz Step for the most recent cellular bands; 824-849 MHz and 869-894 MHz. To find out which you have, program your 2004 for a LIMIT SEARCH of 869-894 MHz. If the 30 KHz flag remains on throughout either of those bands then yours is the 0327A, but if "12.5 KHz" comes on in the 869-870 and 890-894 ranges, then yours is the 0327. Of course, you can always pop the case and look at your CPU. It's marked on the body of the chip. If you have the older chip, you can acquire the newer 0327A from Tandy and install it yourself. 30 KHz steps for the newer CMT sub-bands is the only advantage of the 0327A that I have been able to determine. The CPUs in the PRO-2005 and PRO-2006 already have this update so it's a factor only in PRO-2004's.

Now here is another difference between the PRO-2005/6 and the PRO-2004. I've known about it for some time but have forgotten to mention it. There are two extra IF filters in the PRO-2005/6 that are not in the PRO-2004. One of these is a second 10.7 MHz ceramic IF filter for the WFM section and the other is a narrower 455 KHz ceramic IF filter for the AM section! I don't see a great advantage of the extra 10.7 MHz WFM filter in the PRO-2005/6 but it must improve selectivity and spurious rejection somewhat. But the addition of the narrow 455 KHz filter in the AM section is a definite plus of the PRO-2005/6 over the PRO-2004 which has none there. Here's how you can tell the difference. Program your PRO-2004/5/6's with some CB channels or do a LIMIT SEARCH of 26.96 MHz to 27.41 MHz. When you hear fairly strong signals, stop and check the adjacent channels of + and - 10 KHz from the one where the signal seems the strongest. In the PRO-2004, chances are that you will be able to hear the same signal equally

well on two or more channels. Here's an example: say a signal is on 27.025 MHz (CB Ch-6). If you can clearly hear that same signal on 27.015 and/or 27.035 MHz, then yours is a PRO-2004! PRO-2005/6's won't hear that signal at all or if so, it won't be as clear. This is due to the extra selectivity offered by CF-3 in the PRO-2005/6. We will offer a nice and easy update mod for PRO-2004's and an enhancement for more improvement of PRO-2005/6's in a coming issue so stay tuned.

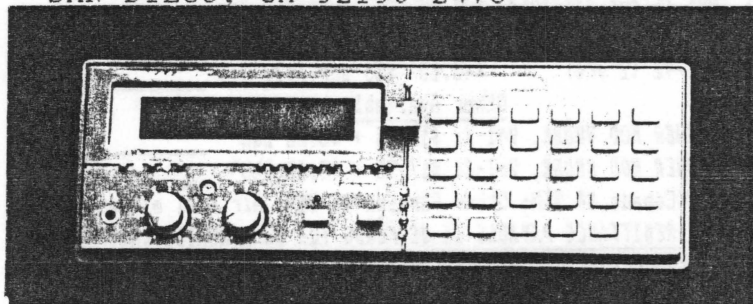
Now here is the tech issue. All PRO-2004/5/6 scanners have the same IF filter for NFM, and it's bandwidth is about 15 KHz, rather wide, but necessary for sloppy NFM stations out there on VHF & UHF. In the PRO-2004, the output of this filter feeds both the NFM and AM sections and is the sole determinant of selectivity. In the PRO-2005/6, the output of this filter feeds the NFM section the same as the PRO-2004, but it also feeds a narrower 6 KHz wide filter (CF-3) at the head of the AM section. This extra filter makes the AM section more selective than the NFM which is righteous and proper! In the PRO-2004, the selectivity of the AM and NFM sections are about the same, which is not so good when it comes to trying to separate the congested CB and Freeband channels between 25-28 MHz. It might also be a problem on the VHF Aero band in crowded flight areas. Good selectivity has always been an elusive goal since radio was invented!

Now the thing is that you might not ever have noticed the deficient selectivity of the AM section in the PRO-2004 because most of your operations may be in the VHF bands where NFM is the common mode and where regulatory frequency coordination helps minimize adjacent channel congestion. Selectivity might not ever have been an issue for you, but if you're a CB'er or completist scannist, then you may have been concerned and this eye-opener can prove fruitful later. I have been improving the selectivity of receivers of all types and kinds for many years and we will concentrate on this area in the issues ahead, not only for the PRO-2004/5/6 but for most scanners as well!

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TURBO-WHOPPER PRO-2006! Shown are the LED Center Tune Meter; LED S-Meter; Keyboard Memory Block Controller LEDs, 4-segDIP Switch for misc switch needs; Extended Delay adjust and LED Indicator for the Extended Delay. Not shown are many more!

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